Sree Narayana Guru College of Engineering & Technology

Est. 2003

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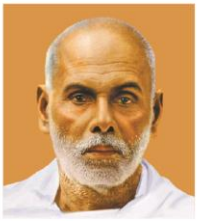
CHALAKKODE P.O., KOROM, PAYYANUR, KANNUR-670 307



COs OF COMPUTER SCIENCE & ENGINEERING DEPARTMENT

Sree Narayana Guru College
of Engineering & Technology
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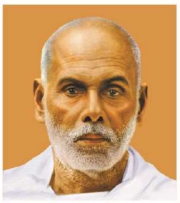

DEPARTMENT OFCOMPUTER SCIENCE AND ENGINEERING

REGULATION	SEMESTER	UNIVERSITY CODE	SUBJECT NAME	CO CODE	COURSE OUTCOME
		MAT 101	LINEAR ALGEBRA AND CALCULUS	CO1	Solve systems of linear equations, diagonalize matrices and characterise quadratic forms
				CO2	Compute the partial and total derivatives and maxima and minima of multivariable functions
				CO3	Compute multiple integrals and apply them to find areas and volumes of geometrical shapes,mass and centre of gravity of plane laminas
				CO4	Perform various tests to determine whether a given series is convergent, absolutely, convergent or conditionally convergent
				CO5	Determine the Taylor and Fourier series expansion of functions and learn their applications.
		CYT100	ENGINEERING CHEMISTRY	CO1	Apply the basic concepts of electrochemistry and corrosion to explore its possible applications in various engineering fields.
				CO2	Understand various spectroscopic techniques like UV-Visible, IR, NMR and its applications.
				CO3	Apply the knowledge of analytical method for characterizing a chemical mixture or a compound. Understand the basic concept of SEM for surface characterisation of nanomaterials.
				CO4	Learn about the basics of stereochemistry and its application. Apply the knowledge of conducting polymers and advanced polymers in engineering.
				CO5	Study various types of water treatment methods to develop skills for treating wastewater.
		EST100	ENGINEERING MECHANICS	CO1	Recall principles and theorems related to rigid body mechanics
				CO2	Identify and describe the components of system of forces acting on the rigid body
				CO3	Apply the conditions of equilibrium to various practical problems involving different force system.

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				CO4	Choose appropriate theorems, principles or formulae to solve problems of mechanics.
				CO5	Solve problems involving rigid bodies, applying the properties of distributed areas and masses
	S1	EST120	BASICS OF CIVIL & MECHANICAL ENGINEERING	CO1	Recall the role of civil engineer in society and to relate the various disciplines of Civil Engineering. Explain different types of buildings, building components, building materials and building construction
				CO2	Describe the importance, objectives and principles of surveying. Summarise the basic infrastructure services MEP, HVAC, elevators, escalators and ramps
				CO3	Discuss the Materials, energy systems, water management and environment for green buildings.Analyse thermodynamic cycles and calculate its efficiency.Illustrate the working and features of IC Engines
				CO4	Explain the basic principles of Refrigeration and Air Conditioning. Describe the working of hydraulic machines
				CO5	Explain the working of power transmission elements.Describe the basic manufacturing, metal joining and machining processes
		HUN101	LIFE SKILLS(LS)	CO1	Define and Identify different life skills required in personal and professional life
				CO2	Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.
				CO3	Explain the basic mechanics of effective communication and demonstrate these through presentations.
				CO4	Take part in group discussions
				CO5	Use appropriate thinking and problem solving techniques to solve new problems.Understand the basics of teamwork and leadership
				CO1	Understand and practice different techniques of quantitative chemical analysis to generate experimental skills and apply these skills to various analyses
				CO2	Develop skills relevant to synthesize organic polymers and acquire the practical skill to use TLC for the identification of drugs

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	CYL120	ENGINEERING CHEMISTRY LAB(CHEM LAB)	CO3	Develop the ability to understand and explain the use of modern spectroscopic techniques for analysing and interpreting the IR spectra and NMR spectra of someorganic compounds
			CO4	Acquire the ability to understand, explain and use instrumental techniques for chemical analysis.Learn to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.
			CO5	Function as a member of a team, communicate effectively and engage in further learning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum
	ESL120	CIVIL & MECHANICAL WORKSHOP	CO1	Name different devices and tools used for civil engineering measurements.Explain the use of various tools and devices for various field measurements
			CO2	Demonstrate the steps involved in basic civil engineering activities like plot measurement, setting out operation, evaluating the natural profile of land, plumbing and undertaking simple construction work.
			CO3	Choose materials and methods required for basic civil engineering activities like field measurements, masonry work and plumbing.
			CO4	Compare different techniques and devices used in civil engineering measurements Identify Basic Mechanical workshop operations in accordance with the material and objects
			CO5	Apply appropriate Tools and Instruments with respect to the mechanical workshop trades.Apply appropriate safety measures with respect to the mechanical workshop trades
	EST110	ENGINEERING GRAPHICS	CO1	Draw the projection of points and lines located in different quadrants
			CO2	Prepare multiview orthographic projections of objects by visualizing them in different positions
			CO3	Draw sectional views and develop surfaces of a given object
			CO4	Prepare pictorial drawings using the principles of isometric and perspective projections to visualize objects in three dimensions.
			CO5	Convert 3D views to orthographic views.Obtain multiview projections and solid models of objects using CAD tools
			CO1	Apply fundamental concepts and circuit laws to solve simple DC electric circuits

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		EST130	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	CO2	Develop and solve models of magnetic circuits
				CO3	Apply the fundamental laws of electrical engineering to solve simple ac circuits in steady state
				CO4	Describe working of a voltage amplifier
				CO5	Outline the principle of an electronic instrumentation system. Explain the principle of radio and cellular communication
		MAT102	VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS	CO1	Compute the derivatives and line integrals of vector functions and learn their applications
				CO2	Evaluate surface and volume integrals and learn their inter-relations and applications.
				CO3	Solve homogeneous and non-homogeneous linear differential equation with constant coefficients
				CO4	Compute Laplace transform and apply them to solve ODEs arising in engineering
				CO5	Determine the Fourier transforms of functions and apply them to solve problems arising engineering
		HUN102	PROFESSIONAL COMMUNICATION	CO1	Develop vocabulary and language skills relevant to engineering as a profession
				CO2	Analyze, interpret and effectively summarize a variety of textual content.Create effective technical presentations
				CO3	Discuss a given technical/non-technical topic in a group setting and arrive at generalizations/consensus
				CO4	Identify drawbacks in listening patterns and apply listening techniques for specific needs.
				CO5	Create professional and technical documents that are clear and adhering to all the necessary conventions
	S2			C01	Demonstrate safety measures against electric shocks.
				C02	Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteries and standard symbols

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ESL130	ELECTRICAL & ELECTRONICS WORKSHOP	C03	Develop the connection diagram, identify the suitable accessories and materials necessary for wiring simple lighting circuits for domestic buildings
		C04	Identify and test various electronic components.Draw circuit schematics with EDA tools
		C05	Assemble and test electronic circuits on boards.Work in a team with good interpersonal skills
PHL120	ENGINEERING PHYSICS LAB	CO1	Develop analytical/experimental skills and impart prerequisite hands on experience for engineering laboratories
		CO2	Understand the need for precise measurement practices for data recording
		CO3	Understand the principle, concept, working and applications of relevant technologies and comparison of results with theoretical calculations
		CO4	Analyze the techniques and skills associated with modern scientific tools such as lasers and fiber optics
		CO5	Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results
PHT100	ENGINEERING PHYSICS	CO1	Compute the quantitative aspects of waves and oscillations in engineering systems.
		CO2	Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments.
		CO3	Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices.
		CO4	Classify the properties of magnetic materials and apply vector calculus to static magnetic fields and use Maxwell's equations to diverse engineering problems
		CO5	Analyze the principles behind various superconducting applications, explain the working of solid state lighting devices and fibre optic communication system
		CO1	Analyze a computational problem and develop an algorithm/flowchart to find its solution
		CO2	Develop readable* C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators.

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		EST 102	PROGRAMING IN C	CO3	Write readable C programs with arrays, structure or union for storing the data to be processed
				CO4	Divide a given computational problem into a number of modules and develop a readable multi-function C program by using recursion if required, to find the solution to the computational problem
				CO5	Write readable C programs which use pointers for array processing and parameter passing and Develop readable C programs with files for reading input and storing output
		MAT 203	DISCRETE MATHEMATICAL STRUCTURES	CO1	Check the validity of predicates in Propositional and Quantified Propositional Logic using truth tables, deductive reasoning and inference theory on Propositional Logic (Cognitive Knowledge Level: Apply)
				CO2	Solve counting problems by applying the elementary counting techniques - Rule of Sum, Rule of Product, Permutation, Combination, Binomial Theorem, Pigeonhole Principle and Principle of Inclusion and Exclusion (Cognitive Knowledge Level: Apply)
				CO3	Classify binary relations into various types and illustrate an application for each type of binary relation, in Computer Science (Cognitive Knowledge Level: Understand)
				CO4	Illustrate an application for Partially Ordered Sets and Complete Lattices, in Computer Science (Cognitive Knowledge Level: Apply)
				CO5	Explain Generating Functions and solve First Order and Second Order Linear Recurrence Relations with Constant Coefficients , Illustrate the abstract algebraic systems - Semigroups, Monoids, Groups, Homomorphism and Isomorphism of Monoids and Groups(Cognitive Knowledge Level: Understand, Apply)
		CST 201	DATA STRUCTURES	CO1	Design an algorithm for a computational task and calculate the time/space complexities of that algorithm (Cognitive Knowledge Level: Apply)
				CO2	Identify the suitable data structure (array or linked list) to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of the computational problem (Cognitive Knowledge Level: Apply)
				CO3	Write an algorithm to find the solution of a computational problem by selecting an appropriate data structure (binary tree/graph) to represent a data item to be processed (Cognitive Knowledge Level: Apply)

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				CO4	Store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set (Cognitive Knowledge Level: Apply)
				CO5	Select appropriate sorting algorithms to be used in specific circumstances (Cognitive Knowledge Level: Analyze) and Design and implement Data Structures for solving real world problems efficiently (Cognitive Knowledge Level: Apply)
		CST 203	LOGIC SYSTEM DESIGN	CO1	Illustrate decimal, binary, octal, hexadecimal and BCD number systems, perform conversions among them and do the operations - complementation, addition, subtraction, multiplication and division on binary numbers (Cognitive Knowledge level: Understand)
				CO2	Simplify a given Boolean Function and design a combinational circuit to implement the simplified function using Digital Logic Gates (Cognitive Knowledge level: Apply)
				CO3	Design combinational circuits - Adders, Code Convertors, Decoders, Magnitude Comparators, Parity Generator/Checker and design the Programmable Logic Devices - ROM and PLA. (Cognitive Knowledge level: Apply)
				CO4	Design sequential circuits - Registers, Counters and Shift Registers. (Cognitive Knowledge level: Apply)
				CO5	Use algorithms to perform addition and subtraction on binary, BCD and floating point numbers (Cognitive Knowledge level: Understand)
	S3	CST 205	OBJECT ORIENTED PROGRAMMING USING JAVA	CO1	Write Java programs using the object oriented concepts - classes, objects, constructors, data hiding, inheritance and polymorphism (Cognitive Knowledge Level: Apply)
				CO2	Utilise datatypes, operators, control statements, built in packages & interfaces, Input/ Output Streams and Files in Java to develop programs (Cognitive Knowledge Level: Apply)
				CO3	Illustrate how robust programs can be written in Java using exception handling mechanism (Cognitive Knowledge Level: Understand)
				CO4	Write application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level: Apply)
				CO5	Write Graphical User Interface based application programs by utilising event handling features and Swing in Java (Cognitive Knowledge Level: Apply)
				C01	Draw the projection of points and lines located in different quadrants

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EST 200	DESIGN AND ENGINEERING	CO2	Prepare multiview orthographic projections of objects by visualizing them in different positions
		CO3	Draw sectional views and develop surfaces of a given object
		CO4	Prepare pictorial drawings using the principles of isometric and perspective projections to visualize objects in three dimensions.
		CO5	Convert 3D views to orthographic views, Obtain multiview projections and solid models of objects using CAD tools
MCN 201	SUSTAINABLE ENGINEERING	CO1	Understand the relevance and the concept of sustainability and the global initiatives in this direction
		CO2	Explain the different types of environmental pollution problems and their sustainable solutions
		CO3	Discuss the environmental regulations and standards
		CO4	Outline the concepts related to conventional and non-conventional energy
		CO5	Demonstrate the broad perspective of sustainable practices by utilizing engineering
CSL 201	DATA STRUCTURES LAB	CO1	Examine a given Data Structure to determine its space complexity and time complexities of operations on it (Cognitive Knowledge Level: Apply)
		CO2	Design and implement an efficient data structure to represent given data (Cognitive Knowledge Level: Apply)
		CO3	Write a time/space efficient program to convert an arithmetic expression from one notation to another (Cognitive Knowledge Level: Apply) and linked lists to simulate Memory Allocation and Garbage Collection (Cognitive Knowledge Level: Apply)
		CO4	Realize how periodic functions are constituted by sinusoids
		CO5	Simulate random processes and understand their statistics
		CO1	Implement the Object Oriented concepts - constructors, inheritance, method overloading & overriding and polymorphism in Java (Cognitive Knowledge Level: Apply)

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		CSL 203	OBJECT ORIENTED PROGRAMMING LAB (IN JAVA)	CO2	Implement programs in Java which use datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and Files (Cognitive Knowledge Level: Apply)
				CO3	Implement robust application programs in Java using exception handling (Cognitive Knowledge Level: Apply)
				CO4	Implement application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level: Apply)
				CO5	Implement Graphical User Interface based application programs by utilizing event handling features and Swing in Java (Cognitive Knowledge Level: Apply)
	S4	MAT 206	GRAPH THEORY	CO1	Explain vertices and their properties, types of paths, classification of graphs and trees & their properties. (Cognitive Knowledge Level: Understand)
				CO2	Demonstrate the fundamental theorems on Eulerian and Hamiltonian graphs. (Cognitive Knowledge Level: Understand)
				CO3	Illustrate the working of Prim's and Kruskal's algorithms for finding minimum cost spanning tree and Dijkstra's and Floyd-Warshall algorithms for finding shortest paths. (Cognitive Knowledge Level: Apply)
				CO4	Explain planar graphs, their properties and an application for planar graphs. (Cognitive Knowledge Level: Apply)
				CO5	Illustrate how one can represent a graph in a computer. (Cognitive Knowledge Level: Apply)
		HUT 200	PROFESSIONAL ETHICS	CO1	Understand the core values that shape the ethical behaviour of a professional.
				CO2	Adopt a good character and follow an ethical life.
				CO3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.
				CO4	Solve moral and ethical problems through exploration and assessment by established experiments.
				CO5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.
		MCN 202	CONSTITUTION OF INDIA	CO1	Understand the core values that shapes the ethical behaviour of a professional.
				CO2	Adopt a good character and follow an ethical life.
				CO3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics
				CO4	Solve moral and ethical problems through exploration and assessment by established experiments.

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				CO5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.
		CST 202	COMPUTER ORGANISATION AND ARCHITECTURE	CO1	Recognize and express the relevance of basic components, I/O organization and pipelining schemes in a digital computer (Cognitive knowledge: Understand)
				CO2	Explain the types of memory systems and mapping functions used in memory systems (Cognitive Knowledge Level: Understand)
				CO3	Demonstrate the control signals required for the execution of a given instruction (Cognitive Knowledge Level: Apply))
				CO4	Illustrate the design of Arithmetic Logic Unit and explain the usage of registers in it (Cognitive Knowledge Level: Apply)
				CO5	Explain the implementation aspects of arithmetic algorithms in a digital computer (Cognitive Knowledge Level:Apply) and control logic for a given arithmetic problem(Cognitive Knowledge Level: Apply)
		CST 204	DATABASE MANAGEMENT SYSTEMS	CO1	Summarize and exemplify fundamental nature and characteristics of database systems (Cognitive Knowledge Level: Understand)
				CO2	Model real word scenarios given as informal descriptions, using Entity Relationship diagrams. (Cognitive Knowledge Level: Apply)
				CO3	Model and design solutions for efficiently representing and querying data using relational model (Cognitive Knowledge Level: Analyze)
				CO4	Demonstrate the features of indexing and hashing in database applications (Cognitive Knowledge Level: Apply)
				CO5	Discuss and compare the aspects of Concurrency Control and Recovery in Database systems (Cognitive Knowledge Level: Apply) and explain various types of NoSQL databases (Cognitive Knowledge Level: Understand)
TION		CST 206	OPERATING SYSTEMS	CO1	Explain the relevance, structure and functions of Operating Systems in computing devices. (Cognitive knowledge: Understand)
				CO2	Illustrate the concepts of process management and process scheduling mechanisms employed in Operating Systems. (Cognitive knowledge: Understand)
				CO3	Explain process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors (Cognitive knowledge: Understand)

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				CO4	Explain any one method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems. (Cognitive knowledge: Understand)
				CO5	Explain the memory management algorithms in Operating Systems. (Cognitive knowledge: Understand) and storage management in Operating Systems. (Cognitive knowledge: Understand)
		CSL204	OPERATING SYSTEMS LAB	CO1	Illustrate the use of systems calls in Operating Systems. (Cognitive knowledge: Understand)
				CO2	Implement Process Creation and Inter Process Communication in Operating Systems. (Cognitive knowledge: Apply)
				CO3	Implement Fist Come First Served, Shortest Job First, Round Robin and Priority-based CPU Scheduling Algorithms. (Cognitive knowledge: Apply)
				CO4	Illustrate the performance of First In First Out, Least Recently Used and Least Frequently Used Page Replacement Algorithms. (Cognitive knowledge: Apply)
				CO5	Implement modules for Deadlock Detection and Deadlock Avoidance in Operating Systems. (Cognitive knowledge: Apply) and Implement modules for Storage Management and Disk Scheduling in Operating Systems. (Cognitive knowledge: Apply)
		CSL 202	DIGITAL LAB	CO1	Design and implement combinational logic circuits using Logic Gates (Cognitive Knowledge Level: Apply)
				CO2	Design and implement sequential logic circuits using Integrated Circuits (Cognitive Knowledge Level: Apply)
				CO3	Simulate functioning of digital circuits using programs written in a Hardware Description Language (Cognitive Knowledge Level: Apply)
				CO4	Function effectively as an individual and in a team to accomplish a given task of designing and implementing digital circuits (Cognitive Knowledge Level: Apply)
		CST 301	FORMAL LANGUAGES AND AUTOMATA THEORY	CO1	Classify a given formal language into Regular, Context-Free, Context Sensitive, Recursive or Recursively Enumerable. [Cognitive knowledge level: Understand]
				CO2	Explain a formal representation of a given regular language as a finite state automaton, regular grammar, regular expression and Myhill-Nerode relation. [Cognitive knowledge level: Understand]
				CO3	Design a Pushdown Automaton and a Context-Free Grammar for a given context-free language. [Cognitive knowledge level : Apply]
				CO4	Design Turing machines as language acceptors or transducers. [Cognitive knowledge level: Apply]

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				CO5	Explain the notion of decidability. [Cognitive knowledge level: Understand]
		CST 303	COMPUTER NETWORKS	CO1	Explain the features of computer networks, protocols, and network design models (Cognitive Knowledge: Understand) and describe the fundamental characteristics of the physical layer and identify the usage in network communication (Cognitive Knowledge: Apply)
				CO2	Explain the design issues of data link layer, link layer protocols, bridges and switches (Cognitive Knowledge: Understand)
				CO3	Illustrate wired LAN protocols (IEEE 802.3) and wireless LAN protocols (IEEE 802.11) (Cognitive Knowledge: Understand)
				CO4	Select appropriate routing algorithms, congestion control techniques, and Quality of Service requirements for a network (Cognitive Knowledge: Apply)
				CO5	Illustrate the functions and protocols of the network layer, transport layer, and application layer in inter-networking (Cognitive Knowledge: Understand)
		CST 305	SYSTEM SOFTWARE	CO1	Distinguish softwares into system and application software categories. (Cognitive Knowledge Level: Understand)
				CO2	Identify standard and extended architectural features of machines. (Cognitive Knowledge Level: Apply)
				CO3	Identify machine dependent features of system software (Cognitive Knowledge Level: Apply)
				CO4	Identify machine independent features of system software. (Cognitive Knowledge Level: Understand)
				CO5	Design algorithms for system softwares and analyze the effect of data structures. (Cognitive Knowledge Level: Apply) and understand the features of device drivers and editing & debugging tools.(Cognitive Knowledge Level: Understand)
		CST 307	MICROPROCESSORS AND MICROCONTROLLERS	CO1	Illustrate the architecture, modes of operation and addressing modes of microprocessors (Cognitive knowledge: Understand)
				CO2	Develop 8086 assembly language programs. (Cognitive Knowledge Level: Apply)
				CO3	Demonstrate interrupts, its handling and programming in 8086. (Cognitive Knowledge Level: Apply))
				CO4	Illustrate how different peripherals (8255,8254,8257) and memory are interfaced with microprocessors. (Cognitive Knowledge Level: Understand)
				CO5	Outline features of microcontrollers and develop low level programs. (Cognitive Knowledge Level: Understand)
	S5			CO1	Demonstrate Traditional and Agile Software Development approaches (Cognitive Knowledge Level: Apply)

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		CST 309	MANAGEMENT OF SOFTWARE SYSTEMS	CO2	Prepare Software Requirement Specification and Software Design for a given problem. (Cognitive Knowledge Level: Apply)
				CO3	Justify the significance of design patterns and licensing terms in software development, prepare testing, maintenance and DevOps strategies for a project. (Cognitive Knowledge Level: Apply)
				CO4	Make use of software project management concepts while planning, estimation, scheduling, tracking and change management of a project, with a traditional/agile framework. (Cognitive Knowledge Level: Apply)
				CO5	Utilize SQA practices, Process Improvement techniques and Technology advancements in cloud based software models and containers & microservices. (Cognitive Knowledge Level: Apply)
		MCN 301	DISASTER MANAGEMENT	CO1	Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle (Cognitive knowledge level: Understand).
				CO2	Distinguish between different hazard types and vulnerability types and do vulnerability assessment (Cognitive knowledge level: Understand).
				CO3	Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk (Cognitive knowledge level: Understand).
				CO4	Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community (Cognitive knowledge level: Apply)
				CO5	Explain the various legislations and best practices for disaster management and risk reduction at national and international level (Cognitive knowledge level: Understand).
		CSL 331	SYSTEM SOFTWARE AND MICROPROCESSORS LAB	CO1	Develop and execute programs to interface stepper motor, 8255, 8279 and digital to analog converters with 8086 trainer kit (Cognitive Knowledge Level: Apply)
				CO2	Implement and execute different scheduling and paging algorithms in OS (Cognitive Knowledge Level: Apply)
				CO3	Design and implement assemblers, Loaders and macroprocessors. (Cognitive Knowledge Level: Apply)
				CO4	Implement FIR low pass filter.
				CO5	Implement real time LTI systems with block convolution and FFT
				CO1	Design database schema for a given real world problem-domain using standard design and modeling approaches. (Cognitive Knowledge Level: Apply)
				CO2	Construct queries using SQL for database creation, interaction, modification, and updation. (Cognitive Knowledge Level: Apply)

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		CSL 333	DATABASE MANAGEMENT SYSTEMS LAB	CO3	Design and implement triggers and cursors. (Cognitive Knowledge Level: Apply)
				CO4	Implement procedures, functions, and control structures using PL/SQL. (Cognitive Knowledge Level: Apply)
				CO5	Perform CRUD operations in NoSQL Databases. (Cognitive Knowledge Level: Apply) and database applications using front-end tools and back-end DBMS. (Cognitive Knowledge Level: Create)
		CST 302	COMPILER DESIGN	CO1	Explain the phases in compilation process(lexical analysis, syntax analysis, semantic analysis, intermediate code generation, code optimization and code generation) and model a lexical analyzer (Cognitive Knowledge Level: Apply)
				CO2	Model language syntax using Context Free Grammar and develop parse tree representation using leftmost and rightmost derivations (Cognitive Knowledge Level: Apply)
				CO3	Compare different types of parsers(Bottom-up and Top-down) and construct parser for a given grammar (Cognitive Knowledge Level: Apply)
				CO4	Build Syntax Directed Translation for a context free grammar, compare various storage allocation strategies and classify intermediate representations (Cognitive Knowledge Level: Apply)
				CO5	Illustrate code optimization and code generation techniques in compilation (Cognitive Knowledge Level: Apply)
		CST 304	COMPUTER GRAPHICS AND IMAGE PROCESSING	CO1	Describe the working principles of graphics devices(Cognitive Knowledge level: Understand)
				CO2	Illustrate line drawing, circle drawing and polygon filling algorithms(Cognitive Knowledge level: Apply)
				CO3	Demonstrate geometric representations, transformations on 2D & 3D objects, clipping algorithms and projection algorithms(Cognitive Knowledge level: Apply)
				CO4	Summarize visible surface detection methods(Cognitive Knowledge level: Understand)
				CO5	Summarize the concepts of digital image representation, processing and demonstrate pixel relationships(Cognitive Knowledge level: Apply) and solve image enhancement and segmentation problems using spatial domain techniques(Cognitive Knowledge level: Apply)
				CO2	Derive recurrence equations and solve it using Iteration, Recurrence Tree, Substitution and Master's Method to compute time complexity of algorithms. (Cognitive Level: Apply)
				CO3	Illustrate Graph traversal algorithms & applications and Advanced Data structures like AVL trees and Disjoint set operations. (Cognitive Level: Apply)

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	S6	CST 306	ALGORITHM ANALYSIS AND DESIGN	CO4	Demonstrate Divide-and-conquer, Greedy Strategy, Dynamic programming, Branch-and Bound and Backtracking algorithm design techniques (Cognitive Level: Apply)
				CO5	Classify a problem as computationally tractable or intractable, and discuss strategies to address intractability (Cognitive Level: Understand) and identify the suitable design strategy to solve a given problem. (Cognitive Level: Analyze)
				CO6	Understand encoding and decoding of convolution and LDPC codes
		CST 308	COMPREHENSIVE COURSE WORK	CO1	Comprehend the concepts of discrete mathematical structures (Cognitive Knowledge Level: Understand)
				CO2	Comprehend the concepts and applications of data structures (Cognitive Knowledge Level: Understand)
				CO3	Comprehend the concepts, functions and algorithms in Operating System (Cognitive Knowledge Level: Understand))
				CO4	Comprehend the organization and architecture of computer systems (Cognitive Knowledge Level: Understand)
				CO5	Comprehend the fundamental principles of database design and manipulation (Cognitive Knowledge Level: Understand) and comprehend the concepts in formal languages and automata theory Cognitive Knowledge Level: Understand)
		CSL 332	NETWORKING LAB	CO1	Use network related commands and configuration files in Linux Operating System. (Cognitive Knowledge Level: Understand).
				CO2	Develop network application programs and protocols. (Cognitive Knowledge Level: Apply)
				CO3	Analyze network traffic using network monitoring tools. (Cognitive Knowledge Level: Apply)
				CO4	Design and setup a network and configure different network protocols. (Cognitive Knowledge Level: Apply)
				CO5	Develop simulation of fundamental network concepts using a network simulator. (Cognitive Knowledge Level: Apply)
		CSD 334	MINI PROJECT	CO1	Identify technically and economically feasible problems (Cognitive Knowledge Level: Apply)
				CO2	Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes (Cognitive Knowledge Level: Apply)
				CO3	Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions of minimal complexity by using modern tools & advanced programming techniques (Cognitive Knowledge Level: Apply)

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			CO4	Prepare technical report and deliver presentation (Cognitive Knowledge Level: Apply)
			CO5	Apply engineering and management principles to achieve the goal of the project (Cognitive Knowledge Level: Apply)
	HUT 300	INDUSTRIAL ECONOMICS AND FOREIGN TRADE	CO1	Explain the problem of scarcity of resources and consumer behaviour, and to evaluate the impact of government policies on the general economic welfare. (Cognitive knowledge level: Understand)
			CO2	Take appropriate decisions regarding volume of output and to evaluate the social cost of production. (Cognitive knowledge level: Apply)
			CO3	Determine the functional requirement of a firm under various competitive conditions. (Cognitive knowledge level: Analyse)
			CO4	Examine the overall performance of the economy, and the regulation of economic fluctuations and its impact on various sections in the society. (Cognitive knowledge level: Analyse)
			CO5	Determine the impact of changes in global economic policies on the business opportunities of a firm. (Cognitive knowledge level: Analyse)
	CST 372	DATA AND COMPUTER COMMUNICATION	CO1	Identify the characteristics of signals for analog and digital transmissions (Cognitive knowledge: Apply)
			CO2	Identify the issues in data transmission (Cognitive knowledge: Apply)
			CO3	Select transmission media based on characteristics and propagation modes (Cognitive knowledge: Apply)
			CO4	Choose appropriate signal encoding techniques for a given scenario (Cognitive knowledge: Apply)
			CO5	Illustrate multiplexing and spread spectrum technologies (Cognitive knowledge: Apply) and error detection, correction and switching techniques in data communication (Cognitive knowledge: Apply)
	CST401	ARTIFICIAL INTELLIGENCE	CO1	Explain the fundamental concepts of intelligent systems and their architecture. (Cognitive Knowledge Level: Understanding)
			CO2	Illustrate uninformed and informed search techniques for problem solving in intelligent systems. (Cognitive Knowledge Level: Understanding)
			CO3	Solve Constraint Satisfaction Problems using search techniques. (Cognitive Knowledge Level: Apply)
			CO4	Represent AI domain knowledge using logic systems and use inference techniques for reasoning in intelligent systems. (Cognitive Knowledge Level: Apply)
			CO5	Illustrate different types of learning techniques used in intelligent systems (Cognitive Knowledge Level: Understand)

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S7	CST423	CLOUD COMPUTING	CO1	Explain the various cloud computing models and services. (Cognitive Knowledge Level: Understand)
			CO2	Demonstrate the significance of implementing virtualization techniques. (Cognitive Knowledge Level: Understand)
			CO3	Explain different cloud enabling technologies and compare private cloud platforms (Cognitive Knowledge Level: Understand)
			CO4	Apply appropriate cloud programming methods to solve big data problems. (Cognitive Knowledge Level: Apply)
			CO5	Describe the need for security mechanisms in cloud (Cognitive Knowledge Level: Understand) and compare the different popular cloud computing platforms (Cognitive Knowledge Level: Understand)
	CST433	SECURITY IN COMPUTING	CO1	Identify the security services provided against different types of security attacks. (Cognitive Knowledge Level: Understand)
			CO2	Illustrate classical encryption techniques for information hiding. (Cognitive Knowledge Level: Apply)
			CO3	Illustrate symmetric/asymmetric key cryptosystems for secure communication. (Cognitive Knowledge Level: Apply)
			CO4	Explain message integrity and authentication methods in a secure communication scenario. (Cognitive Knowledge Level: Understand)
			CO5	Interpret public/secret key distribution techniques for secure communication. (Cognitive Knowledge Level: Understand)and identify the effects of intruders, malicious software and distributed denial of service attacks on system security. (Cognitive Knowledge Level: Understand).
	CSL411	COMPILER LAB	CO1	Implement lexical analyzer using the tool LEX. (Cognitive Knowledge Level: Apply)
			CO2	Implement Syntax analyzer using the tool YACC. (Cognitive Knowledge Level: Apply)
			CO3	Design NFA and DFA for a problem and write programs to perform operations on it. (Cognitive Knowledge Level: Apply)
			CO4	Design and Implement Top-Down parsers. (Cognitive Knowledge Level: Apply)
			CO5	Design and Implement Bottom-Up parsers. (Cognitive Knowledge Level: Apply) and implement intermediate code for expressions. (Cognitive Knowledge Level: Apply)
			CO1	Identify academic documents from the literature which are related to her/his areas of interest (Cognitive knowledge level: Apply).
			CO2	Read and apprehend an academic document from the literature which is related to her/ his areas of interest (Cognitive knowledge level: Analyze).

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		CSQ413	SEMINAR	CO3	Prepare a presentation about an academic document (Cognitive knowledge level: Create).
				CO4	Give a presentation about an academic document (Cognitive knowledge level: Apply).
				CO5	Prepare a technical report (Cognitive knowledge level:Create).
		ECD 415	PROJECT PHASE 1	CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
				CO5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze) and organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply)
		CET 415	ENVIRONMENTAL IMPACT ASSESSMENT	CO1	Explain the need for minimizing the environmental impacts of developmental activities(Cognitive knowledge level: Understanding,Remembering).
				CO2	Outline environmental legislation & clearance procedure in the country (Cognitive knowledge level: Understanding,Remembering).
				CO3	Apply various methodologies for assessing the environmental impacts of any developmental activity(Cognitive knowledge level: Understanding,Remembering).
				CO4	Conduct an environmental audit(Cognitive knowledge level: Understanding,Remembering).
				CO5	Prepare an environmental impact assessment report(Cognitive knowledge level: Understanding,Remembering).
		CST402	DISTRIBUTED COMPUTING	CO1	Summarize various aspects of distributed computation model and logical time. (Cognitive Knowledge Level: Understand)
				CO2	Illustrate election algorithm, global snapshot algorithm and termination detection algorithm. (Cognitive Knowledge Level: Apply)
				CO3	Compare token based, non-token based and quorum based mutual exclusion algorithms. (Cognitive Knowledge Level: Understand)
				CO4	Recognize the significance of deadlock detection and shared memory in distributed systems. (Cognitive Knowledge Level: Understand)
				CO5	Explain the concepts of failure recovery and consensus. (Cognitive Knowledge Level: Understand) and illustrate distributed file system architectures. (Cognitive Knowledge Level: Understand)
				CO1	Explain the criteria for evaluating programming languages and compare Imperative, Functional and Logic programming languages (Cognitive Knowledge Level: Understand)
				CO2	Illustrate the characteristics of data types and variables (Cognitive Knowledge Level: Apply)

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CST 424	PROGRAMMING PARADIGMS	CO3	Comprehend how control flow structures and subprograms help in developing the structure of a program to solve a computational problem (Cognitive Knowledge Level: Apply)
		CO4	Explain the characteristics of Object-Oriented Programming Languages (Cognitive Knowledge Level: Understand)
		CO5	Compare concurrency constructs in different programming languages (Cognitive Knowledge Level: Understand)
CST434	NETWORK SECURITY PROTOCOLS	CO1	Explain authentication protocols, X.509 authentication service and Public Key Infrastructure (PKI).(Cognitive Knowledge Level: Understand)
		CO2	Identify the security mechanisms in E mail security services. (Cognitive Knowledge Level: Understand)
		CO3	Summarize the network and transport layer security services provided in a secure communication scenario. (Cognitive Knowledge Level: Apply)
		CO4	Describe real time communication security and application layer security protocols. (Cognitive Knowledge Level: Apply)
		CO5	Explain the concepts of firewalls and wireless network security. (Cognitive Knowledge Level: Understand)
CST466	DATA MINING	CO1	Employ the key process of data mining and data warehousing concepts in application domains. (Cognitive Knowledge Level: Understand)
		CO2	Make use of appropriate preprocessing techniques to convert raw data into suitable format for practical data mining tasks (Cognitive Knowledge Level: Apply)
		CO3	Illustrate the use of classification and clustering algorithms in various application domains (Cognitive Knowledge Level: Apply)
		CO4	Comprehend the use of association rule mining techniques. (Cognitive Knowledge Level: Apply)
		CO5	Explain advanced data mining concepts and their applications in emerging domains (Cognitive Knowledge Level: Understand)
CST476	MOBILE COMPUTING	CO1	Describe the various technology trends for next generation cellular wireless networks and use the spreading concept on data transmission (Cognitive knowledge: Apply)
		CO2	Summarize the architecture of various wireless LAN technologies (Cognitive knowledge: Understand)
		CO3	Identify the functionalities of mobile network layer and transport layer (Cognitive knowledge: Understand)
		CO4	Explain the features of Wireless Application Protocol (Cognitive knowledge: Understand) and interpret the security issues in mobile computing and next generation technologies (Cognitive knowledge: Understand)

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				CO5	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).
		CST448	INTERNET OF THINGS	CO1	Outline the fundamentals of IoT and its underlying physical and logical architecture(Cognitive Knowledge Level: Understand)
				CO2	Explain the hardware architectures for IoT (Cognitive Knowledge Level : Understand)
				CO3	Outline the Network architectures for IoT(Cognitive Knowledge Level : Understand)
				CO4	Implement data analytics on the IoT platforms (Cognitive Knowledge Level : Apply)
				CO5	Appreciate the security considerations in IoT (Cognitive Knowledge Level : Understand) and implement IoT applications using the available hardware and software.
		ECD 416	PROJECT PHASE II	CO1	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
				CO2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
				CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
				CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
				CO5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze) and organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).

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